Appendix D: Source rock analysis, in Furer, L.C., and Amoco Oil Co., Data compilation of the 1972 field party, southeast Brooks Range and Fort Yukon, Alaska; Vol 2

Furer, L.C., and Amoco Oil Co.

GMC DATA REPORT 465D

This GMC data report from the Amoco Heritage collection has been made available through funding from the FY2018 USGS National Geological and Geophysical Data Preservation Program, Grant Number G18AP00054. This project report is presented in its original format and has not been reviewed for technical content or for conformity to the editorial standards of DGGS. It should not be used or cited as reviewed data.

2019
State of Alaska
Department of Natural Resources
Division of Geological & Geophysical Surveys
GEOLOGIC MATERIALS CENTER

Ft. Yukon

SOURCE ROCK ANALYSES

CVMS
92-00663724-004

0014

CF74 0230

AMOCO PRODUCTION COMPANY
RESEARCH CENTER

Source Rock Evaluation

Ft. Yukon Basin, Alaska, 1972, Surface Samples

Geochemistry Group

Robert J. Harwood

Distribution:

P. H. Garrison/T. Cooper - Denver
E. E. Lafaye - Denver
Chief Geologist - General Office
W. E. Ayrton - Amoco Canada
W. R. Wallace
J. A. Momyer

Technical Service: 8562CR
Job No.: 9413
Requested by: T. Cooper
DENVER DIVISION

Robert R Thompson (Feb 1, 1973)

Source Rock Evaluation
Ft. Yukon Basin, Alaska
1972 Surface Samples
Denver Division
Technical Service No. 8562CR

Summary

The subject 37 outcrop rock samples from the Ft. Yukon and Kandik Basins indicate that source rocks with up to a VERY GOOD hydrocarbon generation capability exist throughout these basins. However, the kerogens in the northern and central part of the area are in the ADVANCED stage of diagenesis and beyond peak oil and gas generation. Commercial hydrocarbon accumulations are usually not associated with rocks with this high a stage of diagenesis because of thermal destruction of the oil, thermal reduction of rock porosity, and breaching of reservoir seals allowing escape of gas. The high hydrogen Triassic kerogens in the southern part of the basin are in a much lower stage of diagenesis and are at PEAK OIL generation. The southern part of this area is prospective for oil and gas if other geologic factors are favorable.

Introduction

Thirty-seven outcrop rock samples from the Ft. Yukon Basin (Figure 1) were submitted for source rock analysis on August 15, 1972, by T. Cooper as part of the continuing source rock evaluation of this area. Source rock evaluation results for previous samples were reported by Technical Service Memorandum No. 8244CR by R. L. Ames, February 3, 1972.

Discussion

The hydrocarbon generation capability of all these samples ranges from NON-SOURCE to VERY GOOD based on their organic carbon percentages (Tables 1, 4). The U. Ordovician sample (41) is rated as VERY GOOD, the Devonian (4) NON-SOURCE, Mississippian (5) NON-SOURCE, Triassic (23-38) FAIR to VERY GOOD, the Jurassic (6) VERY GOOD, Jurassic to Cretaceous (3, 7, 8) NON-SOURCE to FAIR, the Cretaceous (9, 12-22) NON-SOURCE to VERY GOOD, and a sample of unknown age (10) FAIR.

The kerogen elemental analyses (Table 2) and the visual kerogen analyses (Table 3) both show that many of the samples (except those from the Triassic) are in the ADVANCED stage of kerogen diagenesis. These kerogens are past peak for both oil and gas generation, are well into the zone of thermal oil cracking, and for all practical purposes have ceased hydrocarbon generation. Extracts (Table 1) from these samples, which are very low in amount, show the typical severe thermal cracking and the differential removal of the heavier and lighter normal paraffins on the heavy hydrocarbon plots (Figure 2). The extreme diagenesis could cause significant reductions in organic carbon percentages in comparison to their quantities at lower stages of diagenesis. These diagenesis results are consistent with those from the previous report (Technical Service No. 8244CR). The location of these ADVANCED diagenesis samples is the northern and central part of the study area. Rocks at such a high stage of diagenesis probably have had partial destruction of reservoir porosity and also the breaching of reservoir seals. Areas in such a high stage of diagenesis usually are not prospective for hydrocarbons because of poor reservoir quality and because any dry gas present from both the destruction of the oil and the high temperature gas generation by the kerogens probably would leak away through the breached seals. Gas and oil accumulations from such high diagenesis areas are unknown within our experience.

Sample No. 3 from the northern part of the area has a very low stage of diagenesis on the basis on the visual kerogen analysis (Table 3). This result is completely contrary to all of the surrounding samples (T. S. 8244CR) which are in the ADVANCED stage of diagenesis. The anomalous data probably is caused by contamination of Sample 3 by recent organic material.

The Triassic samples (23-38) are at a lower stage of diagenesis than most of the previous valid samples on the basis of both the elemental analyses and visual kerogen analyses (Tables 2, 3). These Triassic samples are high hydrogen kerogens at peak oil generation, and thus make the southern part of the basin prospective for oil accumulations if other factors are favorable.

A few other probable oil source rocks within or at the end of peak oil generation have been encountered in the southern part of this basin. A moderate number of gas source rocks at peak gas generation previously have been found in the southern Kandik Basin in both Alaska and Canada. The chromatograms of most of the extracts from these current Triassic samples show severe bacterial alteration. This makes the heavy hydrocarbon patterns (Figure 2) somewhat irregular for those few extracts with moderate amounts of normal paraffins remaining.

In conclusion the southern part of the Kandik-Ft. Yukon Basin area in the general vicinity of the Yukon River appears prospective for both oil and gas on the basis of the source rock data. The central and northern parts of the area are probably unfavorable for retention of hydrocarbons because of the advanced state of diagenesis with its attendant thermal destruction of oil, rock porosity, and reservoir sealing properties.

Robert J. Harwood

Robert J. Harwood/jd

OFFICE Denver AREA NW

ANALYST T. Cooper DATE August 15, 1972

TECHNICAL SERVICE NUMBER 8562CR

STATE Alaska COUNTY

TABLE 1a

SAMPLE NUMBER	SAMPLE TYPE	LOCATION	AGE	LITHOLOGY	DEPTH FT.	INSOLUBLE RESIDUE %	TOTAL ORGANIC CARBON WT. %	EXTRACTABLE ORGANIC BBL/ACRE FT.	EXTRACTABLE HYDROCARBON BBL/ACRE FT.	EXTRACT. HYDROCARBON EXT. ORG.	EXTRACT. ORGANIC TOTAL ORG.	HYDROCARBON GENERATION CAPABILITY	EXTRACT BACTERIAL ALTERATION
First Sample No.													
OUTCROP SAMPLES			0.									*	
FORT YUKON BASIN			0.										
R3 (8203)	OUTC	12 E 32N! 67° 35'N, 145° 08'W	J-K	SHALE	0.0	83.9	0.14	0.5	0.1	0.24	0.01	NON-SOURCE	No
R4 (8216)	OUTC	South SW33-1N-27E (Umiat Baseline)	DEV	LIMEST	0.0	9.6	0.22	0.7	0.2	0.30	0.01	NON-SOURCE	No
R5 (8350)	OUTC	N/2 15-25N-21E East	MISS	SHALE	0.0	57.9	0.03	0.6	0.1	0.32	0.05	NON-SOURCE	No
R6 (8360)	OUTC	South SW36-11N-27E	JUR?	SHALE	0.0	83.3	1.50	1.9	0.9	0.45	*0.00	VRGD	No
R7 (8361)	OUTC	NE32-15N-26E East	J-K	SHALE	0.0	91.6	0.85	0.3	0.1	0.54	*0.00	FAIR	No
R8 (8363)	OUTC	" East	J-K	MUDSTO	0.0	88.9	0.89	4.0	0.7	0.17	0.01	FAIR	No
R9 (8367)	OUTC	NE6-20N-24E East	CRET	SHALE	0.0	78.6	0.21	0.5	0.1	0.36	*0.00	NON-SOURCE	No
R10 (8377)	OUTC	NW19-11N-11E South	?	MUDSTO	0.0	78.3	0.75	0.3	*0.0	0.24	*0.00	FAIR	No
R11 (8794)	OUTC	N/2 15-25N-21E East	MISS	SHALE	0.0	96.9	9.01	0.4	0.1	0.37	*0.00	VRGD	No
R12 (9025)	OUTC	NW32-7N-25E East	CRET	SHALE	0.0	87.2	5.71	0.7	0.3	0.50	*0.00	VRGD	No
R13 (9027)	OUTC	" "	CRET	SHALE	0.0	82.6	1.04	0.5	0.2	0.34	*0.00	GOOD	No
R14 (9028)	OUTC	" "	CRET	SHALE	0.0	79.1	1.14	0.4	0.1	0.34	*0.00	GOOD	No
R15 (9029)	OUTC	" "	CRET	SHALE	0.0	80.9	1.07	0.8	0.3	0.44	*0.00	GOOD	No

*Ratio close to zero due to low extract amounts

OFFICE Denver

AUTHORIZED BY T. Cooper

TECHNICAL SERVICE NUMBER 8562CR

STATE Alaska COUNTY

AREA NW

DATE August 15, 1972

AMOCO PRODUCTION COMPANY

RESEARCH CENTER

SOURCE ROCK EVALUATION

TABLE 1b

SAMPLE NUMBER	SAMPLE TYPE	LOCATION	AGE	LITHOLOGY	DEPTH FT.	INSOLUBLE RESIDUE %	TOTAL ORGANIC CARBON WT. %	EXTRACTABLE ORGANIC BBL/ACRE FT.	EXTRACTABLE HYDROCARBON BBL/ACRE FT.	EXTRACT. HYDROCARBON / EXT. ORG.	EXTRACT. ORGANIC / TOTAL ORG.	HYDROCARBON GENERATION CAPABILITY	EXTR BACTE ALTER TION
OUTCROP SAMPLES			0.										
FORT YUKON BASIN			0.										
R16 (9030)	OUTC	NW32-7N-25E East	CRET	SHALE	0.0	84.8	0.81	0.4	0.1	0.43	*0.00	FAIR	No
R17 (9031)	OUTC	" East	CRET	SHALE	0.0	83.7	0.81	0.5	0.2	0.45	*0.00	FAIR	No
R18 (9032)	OUTC	" East	CRET	SHALE	0.0	87.0	0.84	0.4	0.1	0.35	*0.00	FAIR	No
R19 (9033)	OUTC	25-36-6N-27E East	CRET	SHALE	0.0	87.0	1.29	0.5	0.1	0.37	*0.00	GOOD	No
R20 (9034)	OUTC	" East	CRET	SHALE	0.0	86.6	1.15	2.7	0.6	0.24	*0.00	GOOD	No
R21 (9040)	OUTC	" East	CRET	SHALE	0.0	91.7	0.70	0.8	0.3	0.36	*0.00	FAIR	No
R22 (9041)	OUTC	" East	CRET	SHALE	0.0	84.1	1.10	0.4	0.2	0.48	*0.00	GOOD	No
R23 (9042)	OUTC	SE7-4N-30E East	TRIA	SHALE	0.0	49.8	5.05	66.1	4.2	0.06	0.04	VRGD	Yes
R24 (9043)	OUTC	" "	TRIA	SHALE	0.0	39.0	6.23	143.8	4.4	0.03	0.08	VRGD	Yes
R25 (9044)	OUTC	" "	TRIA	LIMEST	0.0	15.7	1.48	44.4	6.5	0.14	0.11	GOOD	Yes
R26 (9045)	OUTC	" "	TRIA	SHALE	0.0	83.1	6.67	118.0	41.6	0.35	0.06	VRGD	Yes
R27 (9046)	OUTC	" "	TRIA	CLAYST	0.0	88.1	0.66	12.1	5.2	0.43	0.06	FAIR	Yes
R28 (9047)	OUTC	" "	TRIA	CLAYST	0.0	92.2	4.08	54.4	25.5	0.47	0.05	VRGD	Yes
(9048)	OUTC	" "	TRIA	MUDSTO	0.0	87.6	3.31	41.4	*25.4	0.61	0.04	VRGD	Yes

*Ratio close to zero due

OFFICE Denver AREA NW

AUTHORIZED BY T. Cooper DATE August 15, 1972

TECHNICAL SERVICE NUMBER 8562CR

STATE Alaska COUNTY

AMOCO PRODUCTION COMPANY

RESEARCH CENTER

SOURCE ROCK EVALUATION

TABLE 1c

SAMPLE NUMBER	SAMPLE TYPE	LOCATION	AGE	LITHOLOGY	DEPTH FT.	INSOLUBLE RESIDUE %	TOTAL ORGANIC CARBON WT. %	EXTRACTABLE ORGANIC BBL/ACRE FT.	EXTRACTABLE HYDROCARBON BBL/ACRE FT.	EXTRACT. HYDROCARBON EXT. ORG.	EXTRACT. ORGANIC TOTAL ORG.	HYDROCARBON GENERATION CAPABILITY	EXTRACTABLE ALTERATION
OUTCROP SAMPLES			0.										
FORT YUKON BASIN			0.										
R30	(9049)	OUTC SE7-4N-30E	TRIA	MUDSTO	0.0	83.9	2.84	32.4	14.2	0.43	0.04	VRGD	Yes
R31	(9050)	OUTC "	TRIA	MUDSTO	0.0	81.2	2.50	34.9	14.8	0.42	0.05	VRGD	Yes
R32	(9051)	OUTC "	TRIA	MUDSTO	0.0	80.5	3.45	51.2	19.2	0.37	0.05	VRGD	Yes
R33	(9052)	OUTC "	TRIA	MUDSTO	0.0	81.8	2.97	43.1	8.3	0.19	0.05	VRGD	Yes
R34	(9053)	OUTC "	TRIA	MUDSTO	0.0	80.2	3.07	58.5	18.9	0.32	0.07	VRGD	Yes
R35	(9054)	OUTC "	TRIA	LIMEST	0.0	25.5	3.12	111.6	19.0	0.17	0.13	VRGD	Yes
R36	(9055)	OUTC "	TRIA	LIMEST	0.0	16.5	1.04	37.9	4.3	0.11	0.13	GOOD	Yes
R37	(9056)	OUTC "	TRIA	LIMEST?	0.0	69.7	7.29	25.7	7.5	0.29	0.01	VRGD	Yes
R38	(9057)	OUTC "	TRIA	LIMEST	0.0	45.8	0.70	37.1	12.8	0.34	0.20	FAIR	Yes
R41	(8804)	OUTC 7-8N-6W south	UORD	CLAYST	0.0	92.1	3.25	0.9	0.2	0.27	*0.00	VRGD	No

*Ratio close to zero due to low extract amounts.

OFFICE Denver AREA NW District

AUTHORIZED BY T. Cooper DATE

TECHNICAL SERVICE NUMBER 8562 CR

STATE (PROVINCE) Alaska COUNTY

WELL LOCATION Ft. Yukon Basin, Outcrop Samples

Amoco Production Company

RESEARCH CENTER
ORGANIC DIAGENESIS DATA

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE QUALITY	FORMATION	LITHOLOGY	DEPTH	ELEMENTAL ANALYSIS, PERCENT CARBON	HYDROGEN	OXYGEN	NITROGEN	RATIO H/C	STATE OF DIAGENESIS	HYDROCARBON TYPE BY % HYDROGEN	PYROLYSIS
R6			Jur (?) 36-11N-27E	Sh.		94.7 4.0	2.1	2.1	.5	.27	Advanced	*	
R8			Jur - Cret 32-15N-26E	Mudstn.		93.9 4.0	2.6	2.6	.2	.33	"	"	
R10			? 19-11N-11E	"		96.3 5.0	2.7	0.8	.3	.34	"	"	
R11			Miss 15-25N-21E Decarb	Sh.		95.9 5.0	2.0	2.0	.2	.25	"	"	
R12			Cret 32-7-25	Sh.		96.7 5.0	1.4	1.4	.0	.17	"	"	
R13			Cret	Sh.		97.2 5.0	0.6	0.6	.2	.07	"	"	
R14			Cret	Sh.		93.2 2.9	1.9	3.7	1.3	.24	"	"	
R15			Cret	Sh.		95.7 5.0	1.7	1.7	.3	.21	"	"	
R16			Cret 32-7N-25E	Sh.		95.8 5.0	1.5	1.5	.2	.19	"	"	
R17			Cret	Sh.		96.6 5.0	1.4	1.4	.0	.17	"	"	
R18			Cret	Sh.		96.4 5.0	1.5	1.5	.0	.19	"	"	
R19			Cret 36-6N-27E	Sh.		96.2 5.0	1.5	1.5	.0	.19	"	"	
R20			Cret	Sh.		94.7 4.7	3.2	3.2	.0	.41	"	"	
R21			Cret	Sh.		91.2 1.9	2.8	5.9	.0	.37	"	"	

REMARKS:

*At this stage of diagenesis kerogen type cannot be determined.

ANALYST [illegible] DATE

TABLE 20

OFFICE Denver AREA NW District

AUTHORIZED BY T. Cooper DATE

TECHNICAL SERVICE NUMBER 8562 CR

STATE (PROVINCE) Alaska COUNTY WELL LOCATION Ft. Yukon Basin, Outcrop Samples

Amoco Production Company

RESEARCH CENTER

ORGANIC DIAGENESIS DATA

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE QUALITY	FORMATION	LITHOLOGY	DEPTH	ELEMENTAL ANALYSIS, PERCENT CARBON	HYDROGEN	OXYGEN	NITROGEN	RATIO H/C	STATE OF DIAGENESIS	HYDROCARBON TYPE BY % HYDROGEN	PYROLYSIS
R22			Cret. 36-6N-27E	Sh.		90.6 .17	2.4	6.8	0	.32	Advanced	*	
R23			Triassic 7-4N-30E	Sh.		85.2 .26	8.5	4.7 .29	1.6	** 1.20	Peak Oil Generation	Oil	
R24			Triassic	Sh.		85.9 .26	8.7	3.6	1.8	** 1.22	"	"	
R26			Triassic	Sh.		83.9 .9	7.7	6.3	2.1	1.10	"	"	
R27			Triassic	Clystn.		81.7 .7	7.0	9.1	2.2	1.03	"	"	
R28			Triassic	"		83.4 .05	7.9	6.7	2.0	1.14	"	"	
R29			Triassic	Mudstn.		83.6	7.6	6.9	2.0	1.09	"	"	
R30			Triassic	"		83.8	7.4	6.8	2.0	1.06	"	"	
R31			Triassic	"		83.4	7.7	6.8	2.2	1.11	"	"	
R32			Triassic	"		83.5	8.0	6.6	2.0	1.15	"	"	
R33			Triassic	"		83.4	7.9	6.8	1.9	1.14	"	"	
R34			Triassic	"		84.3 .9	8.0	5.7	2.0	1.14	"	"	
R35			Triassic	Ls.		84.7 .9	8.8	4.8	1.7	** 1.25	"	"	
R36			Triassic	"		84.5 .9	7.0	7.9	0.3	.99	"	"	

REMARKS:

*At this stage of diagenesis kerogen type cannot be determined.

**These high H/C ratios indicate an excellent convertibility of these kerogens to oil.

ANALYST R. G. Sopka DATE

TABLE 2b

OFFICE Denver AREA NW District

AUTHORIZED BY T. Cooper DATE

TECHNICAL SERVICE NUMBER 8562 CR

STATE (PROVINCE) Alaska COUNTY

WELL LOCATION Ft. Yukon Basin, Outcrop Samples

Amoco Production Company

RESEARCH CENTER

ORGANIC DIAGENESIS DATA

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE QUALITY	FORMATION	LITHOLOGY	DEPTH	ELEMENTAL ANALYSIS, PERCENT CARBON	HYDROGEN	OXYGEN	NITROGEN	RATIO H/C	STATE OF DIAGENESIS	HYDROCARBON TYPE BY % HYDROGEN	PYROLYSIS
R38	O.C.		Triassic 7-4N-30E	Ls.		81.4	7.0	10.3	1.3	1.03	Peak Oil Generation	Oil	

REMARKS:

ANALYST [illegible] DATE

TABLE 20

MICROSCOPIC KEROGEN ANALYSIS

Division: Denver
Well Name: Outcrop samples
Location: SE Alaska
State or Country: Alaska
Geol. Province: Ft. Yukon Basin

SRA No.	Depth (ft)	Formation	Age	Color	Scale	Kerogen Type	Description - Remarks
R-3			J-K	Light Yellow	*1	*Oil type	*99% light yellow amorphous material. 1% small wood particles. Bar of palynomorphs.
R-4			Dev.	Black	6	Gas type	95% charcoal like matter. 5% highly carbonized amorphou material barren of palynomorphs.
R-5			Miss.	Black	6	Oil type (?)	**90% highly carbonized unrecognizable material. 10% charcoal like matter.
R-6			Jur.	Black	7	Oil type (?)	**90% finely divided, unrecognizable material. 5% charcoal like matter with trace of wood.

COLOR	CARBONIZATION SCALE	WEIGHT % CARBON
LIGHT YELLOW	1	65 %
YELLOW	2	≈70%
LIGHT BROWN	3	≈75 %
MEDIUM BROWN	4	≈ 78 %
DARK BROWN	5	≈81%
BLACK	6	≈84 % ≈86 %
ALL ORGANIC MATTER BLACK	7	≈90 %

*Questionable sample quality, organic material probably is non-indigenous.

**Material could be amorphous. If so, kerogen would be oil generating at earlier stage of diagenesis. Amorphous and sapropelic material both contain high hydrogen and are oil generating at suitable levels of diagenesis.

TABLE 3a
TS: 8562CR

MICROSCOPIC KEROGEN ANALYSIS

Division: Denver
Well Name: Outcrop samples
Location: SE Alaska
State or Country: Alaska
Geol. Province: Ft. Yukon Basin

SRA No.	Depth (ft)	Formation	Age	Color	Scale	Kerogen Type	Description - Remarks
R-7			J-K	Brown-Black	6	Oil type (?)	*95% finely-divided, fairly carbonized, unrecognizable material. Trace of wood and charcoal-like matter.
R-8			J-K	Black	6	Oil type (?)	*95% finely-divided, highly carbonized unrecognizable material. Traces of charcoal like matter.
R-9			Cret.	Black	6	Oil type (?)	*95% finely-divided, highly carbonized unrecognizable material. Traces of wood and charcoal like material.
R-10			?	Brown-Black	6**	Oil type (?)	*95% finely-divided, highly carbonized unrecognizable material. Traces of wood and charcoal-like matter.
R-11			Miss.	Black	6**	Oil type (?)	*95% highly carbonized, unrecognizable material. Traces of charcoal-like matter.

* Material could possibly represent amorphous-sapropellic matter. The kerogen could be an oil generator at earlier stage of diagenesis.

** Elemental analysis indicates that these kerogens have probably reached an advanced stage of diagenesis corresponding to Scale 7.

TABLE 3b

TS: 85620

MICROSCOPIC KEROGEN ANALYSIS

Division: Denver
Well Name: Outcrop samples
Location: SE Alaska
State or Country: Alaska
Geol. Province: Ft. Yukon Basin

SRA No.	Depth (ft)	Formation	Age	Color	Scale	Kerogen Type	Description - Remarks
R12			Cret.	Black	~7	Gas type	75% charcoal mineral and wood fragments. 20% highly carbonized amorphous material.
R13			Cret.	Black	~7	Gas type	60% charcoal mineral and wood fragments. 30% highly carbonized amorphous material.
R14			Cret.	Black	~7	Gas type	80% highly carbonized plant debris. 20% wood and charcoal fragments.
R-15			Cret.	Black	~7	Gas type	90% highly carbonized wood and plant debris. 10% highly carbonized amorphous material.
R-16			Cret.	Black	~7	Gas type	90% highly carbonized, finely divided plant debris. Traces of charcoal and wood.
R-17			Cret.	Black	~7	Gas type	100% highly carbonized, finely divided plant debris.

TABLE 3c

TS: 8562CR

MICROSCOPIC KEROGEN ANALYSIS

Division: Denver
Well Name: Outcrop samples
Location: SE Alaska
State or Country: Alaska
Geol. Province: Ft. Yukon Basin

SRA No.	Depth (ft)	Formation	Age	Color	Scale	Kerogen Type	Description - Remarks
R18			Cret.	Black	~7	Gas type	95% finely-divided, highly carbonized plant debris. Traces of wood fragments.
R19			Cret.	Black	~7	Gas type	90% finely-divided, highly carbonized plant debris. 10% charcoal matter.
R20			Cret.	Black	~7	Gas type	95% finely-divided, highly carbonized plant debris. Traces of wood and charcoal matter.
R21			Cret.	Black	~6**	Gas type	95% fairly-carbonized, finely divided, plant debris. Traces of wood and charcoal matter.
R22			Cret.	Black	~6**	*Oil type(?)	95% highly carbonized amorphous looking material. Traces of charcoal mineral matter.

*Possible oil generator at earlier stage of diagenesis.

**Elemental analysis indicates that these kerogens have probably reached an advanced stage of diagenesis corresponding to Scale 7.

TABLE 3d

TS: 85620R

MICROSCOPIC KEROGEN ANALYSIS

Division: Denver
Well Name: Outcrop samples
Location: SE Alaska
State or Country: Alaska
Geol. Province: Ft. Yukon Basin

SRA No.	Depth (ft)	Formation	Age	Color	Scale	Kerogen Type	Description - Remarks
R23			Triassic	Dark Brown	5	Oil type	99% amorphous-sapropellic. Trace of wood fragments.
R24			Triassic	Dark Brown	5	Oil type	99% amorphous-sapropellic. Trace of wood fragments.
R25			Triassic	Dark Brown	5	Oil type	90% amorphous-sapropellic. 10% charcoal like matter.
R26			Triassic	Dark Brown	5	Oil type	90% amorphous-sapropellic. 10% charcoal like matter.
R27			Triassic	Medium Brown	4 (5)	Oil type	80% amorphous-sapropellic. 15% charcoal like matter. Traces of cuticle.
R28			Triassic	Dark Brown	5	Oil type	90% amorphous-sapropellic 10% charcoal like matter.
R29			Triassic	Medium Brown	4	Oil type	95% amorphous-sapropellic 5% charcoal like wood fragments.

TABLE 3e

TS: 856208

MICROSCOPIC KEROGEN ANALYSIS

Division: Denver
Well Name: Outcrop samples
Location: SE Alaska
State or Country: Alaska
Geol. Province: Ft. Yukon Basin

SRA No.	Depth (ft)	Formation	Age	Color	Scale	Kerogen Type	Description - Remarks
R30			Triassic	Medium Brown	4	Oil type	75% amorphous-sapropellic 25% charcoal like material and wood.
R31			Triassic	Medium Brown	4	Oil type	75% amorphous-sapropellic 25% charcoal matter and wood fragments.
R32			Triassic	Medium Brown	4	Oil type	95% amorphous-sapropellic 5% wood fragments and charcoal matter.
R33			Triassic	Medium Brown	4	Oil type	90% amorphous-sapropellic 10% charcoal matter and wood fragments.
R34			Triassic	Dark Brown	5	Oil type	95% amorphous-sapropellic 5% wood fragments.
R35			Triassic	Dark Brown	5	Oil type	95% amorphous-sapropellic 5% wood fragments and charcoal matter.

TABLE 3f

TS: 8562CR

MICROSCOPIC KEROGEN ANALYSIS

Division: Denver
Well Name: Outcrop samples
Location: SE Alaska
State or Country: Alaska
Geol. Province: Ft. Yukon Basin

SRA No.	Depth (ft)	Formation	Age	Color	Scale	Kerogen Type	Description - Remarks
R36			Triassic	Dark Brown	5	Oil type	95% amorphous-sapropellic 5% charcoal and wood fragment.
R37			Triassic	Medium Brown	4	Oil type	90% finely divided amorphous-sapropellic. 10% charcoal fragments.
R38			Triassic	Medium Brown	4	Oil type	85% amorphous-sapropellic. 15% charcoal fragments.
R41			U. Ord.	Black	6	Gas type	95% finely divided, highly carbonized plant debris. 5% charcoal matter.

TABLE 3g

TS: 8562Ca

TABLE 4a
T.S. 8562CR

Over-All Source Rock Rating

Sample No.	Age	Hydrocarbon Generation Capability	Original Kerogen Type	Diagenesis Stage
R-3	J-K	Non source	Oil? (probable contamination)	Pregeneration? (probable contamination)
4	Dev	Non source	Gas	Advanced (past peak gas generation)
5	Miss	Non source	Oil?	"
6	Jur?	Very good	Oil?	"
7	J-K	Fair	Oil?	"
8	J-K	Fair	Oil?	"
9	Cret	Non source	Oil?	"
10	?	Fair	Oil?	"
11	Miss	Very good	Oil?	"
12	Cret	Very good	Gas	"
13	Cret	Good	Gas	"
14	Cret	Good	Gas	"
15	Cret	Good	Gas	"
16	Cret	Fair	Gas	"
17	Cret	Fair	Gas	"
18	Cret	Fair	Gas	"
19	Cret	Good	Gas	"
20	Cret	Good	Gas	"
21	Cret	Fair	Gas	"
22	Cret	Good	Oil?	"
23	Tria	Very good	Oil	Peak oil generation
24	Tria	Very good	Oil	"

Sample No.	Age	Hydrocarbon Generation Capability	Original Kerogen Type	Diagenesis Stage
R-25	Tria	Good	Oil	Peak oil generation
26	Tria	Very good	Oil	"
27	Tria	Fair	Oil	"
28	Tria	Very good	Oil	"
29	Tria	Very good	Oil	"
30	Tria	Very good	Oil	"
31	Tria	Very good	Oil	"
32	Tria	Very good	Oil	"
33	Tria	Very good	Oil	"
34	Tria	Very good	Oil	"
35	Tria	Very good	Oil	"
36	Tria	Good	Oil	"
37	Tria	Very good	Oil	"
38	Tria	Fair	Oil	"
41	U. Ord.	Very good	Gas	Advanced (past peak gas generation)

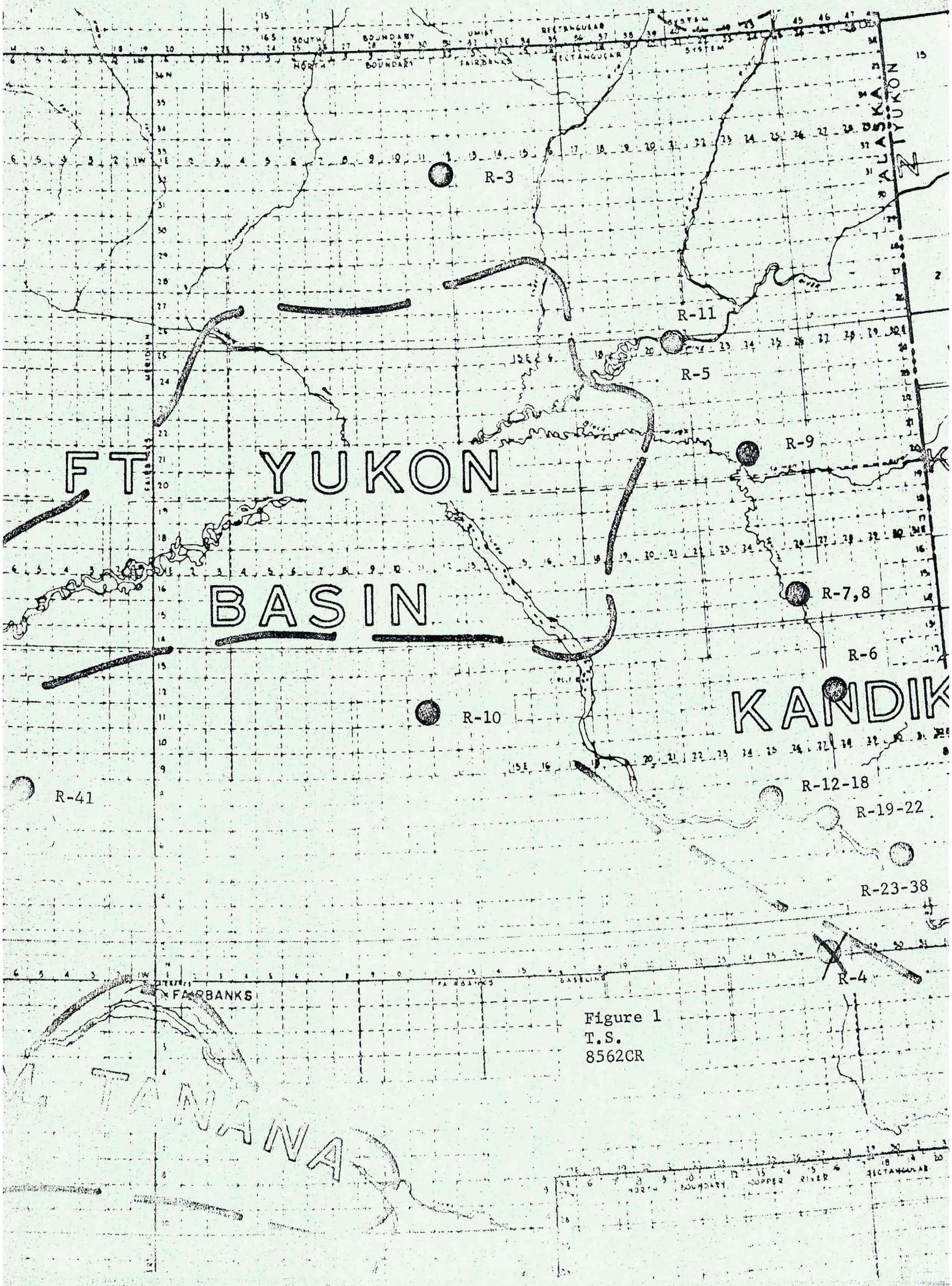

Figure 1
T.S.
8562CR

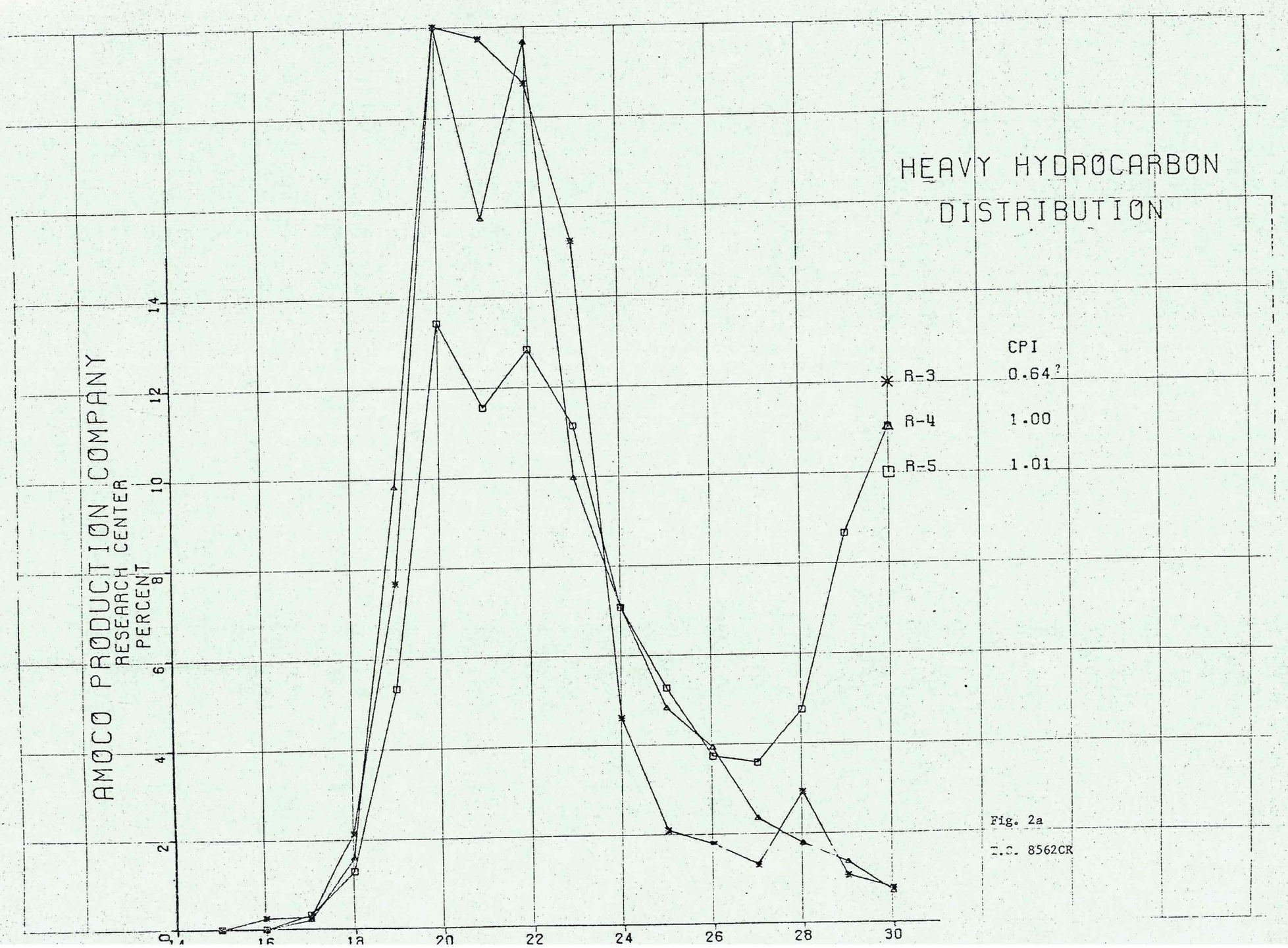

Fig. 2a

T.C. 8562CR

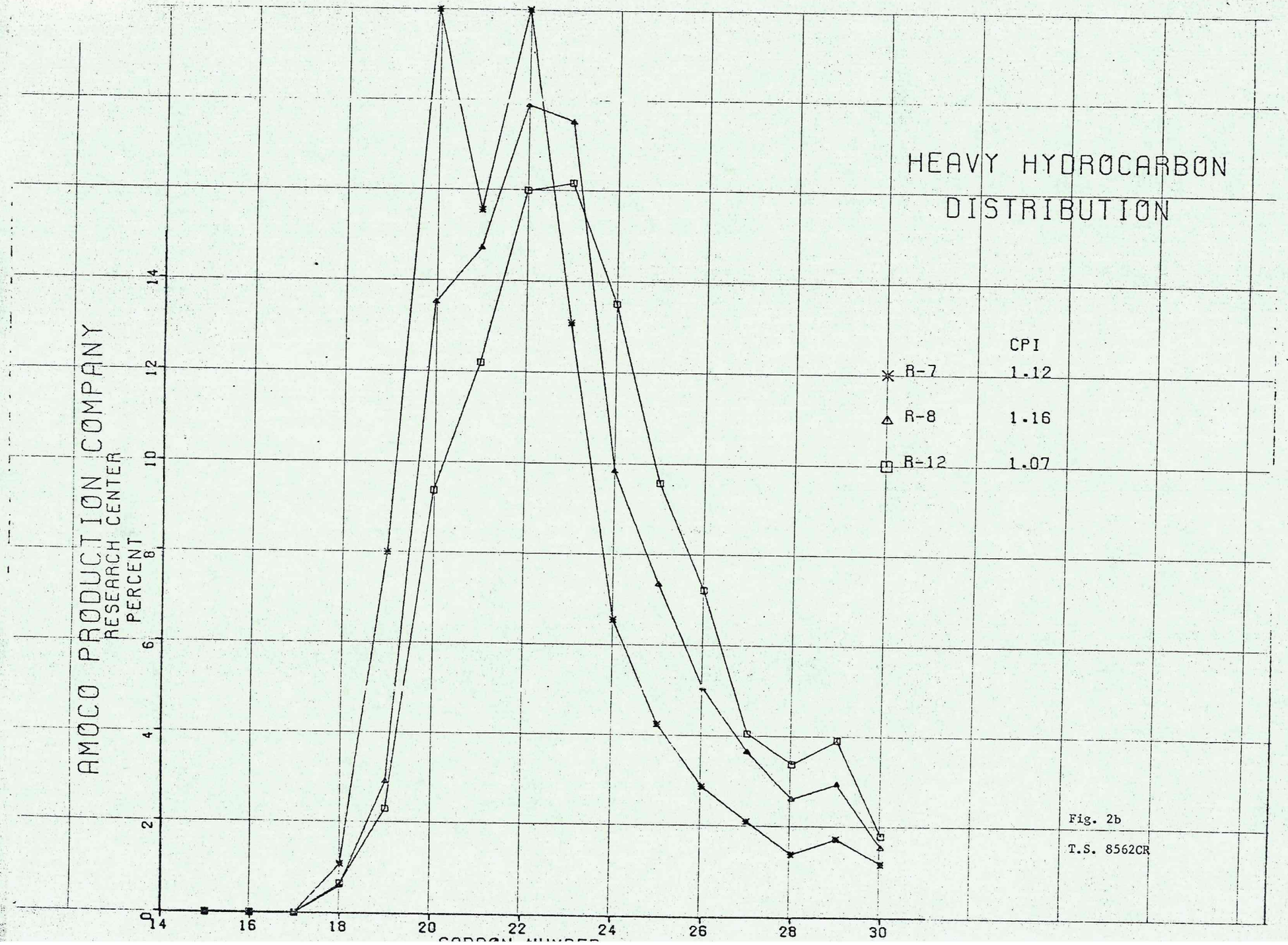

Fig. 2b

T.S. 8562CR

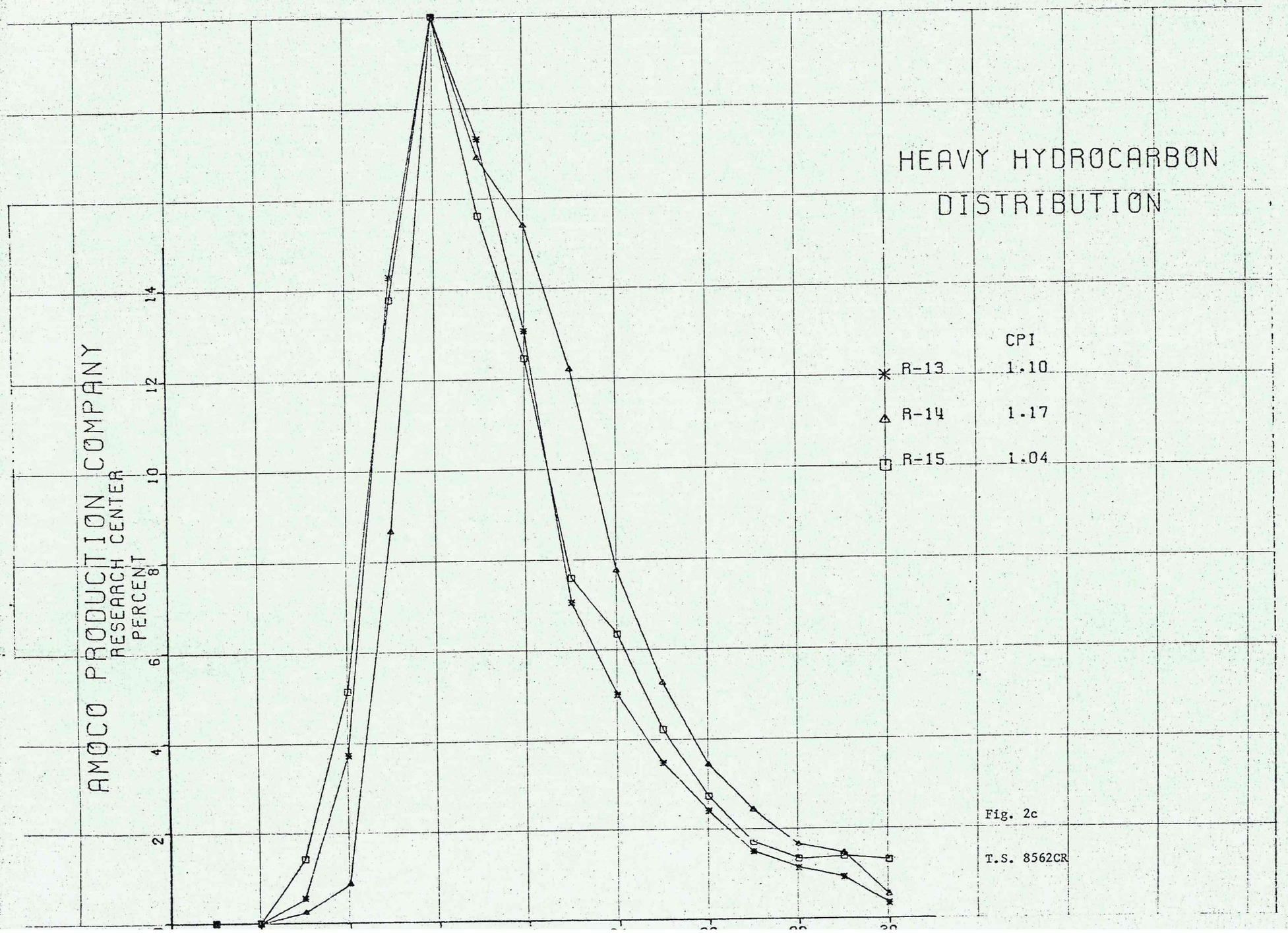

Fig. 2c

T.S. 8562CR

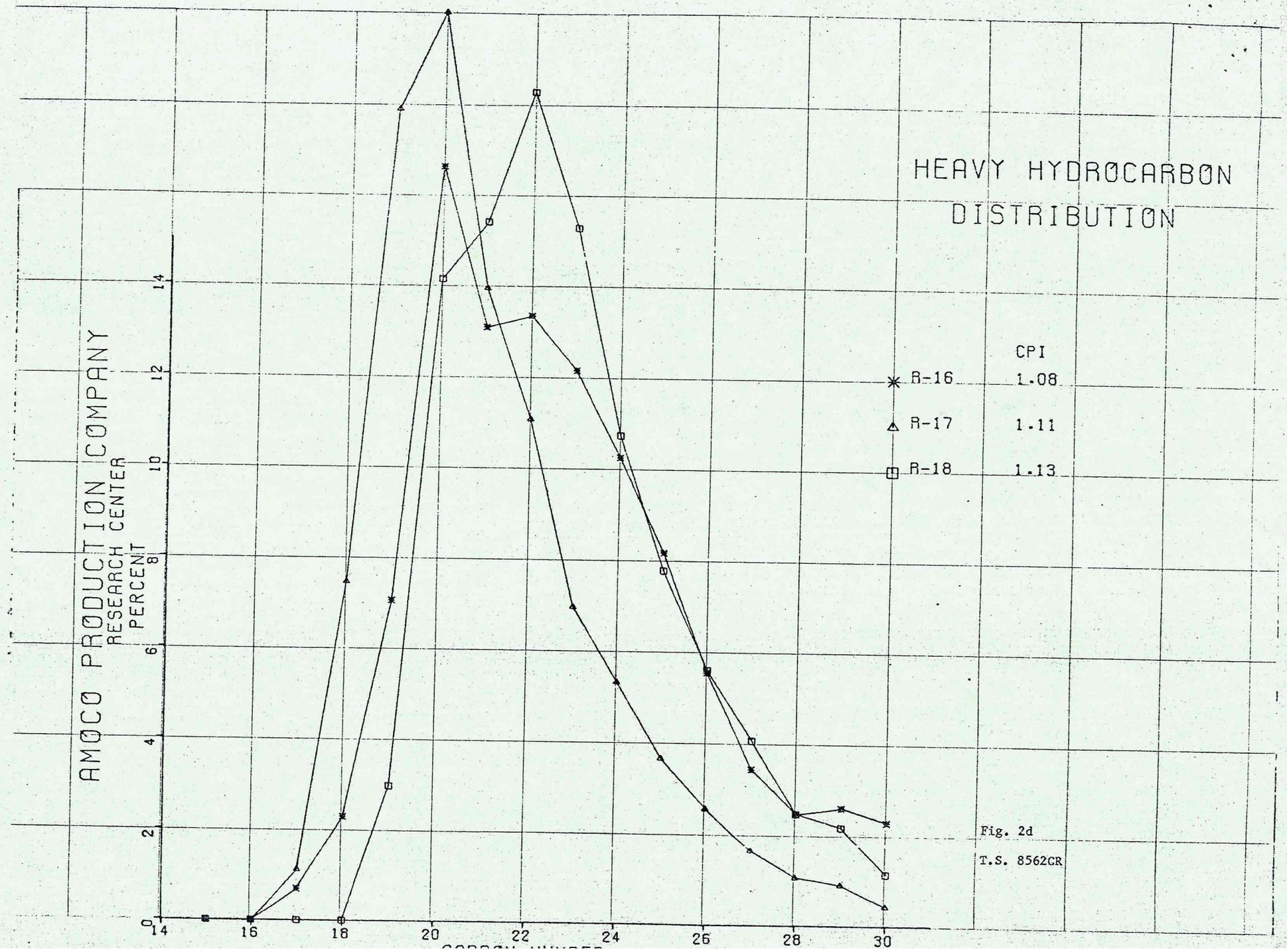

Fig. 2d

T.S. 8562CR

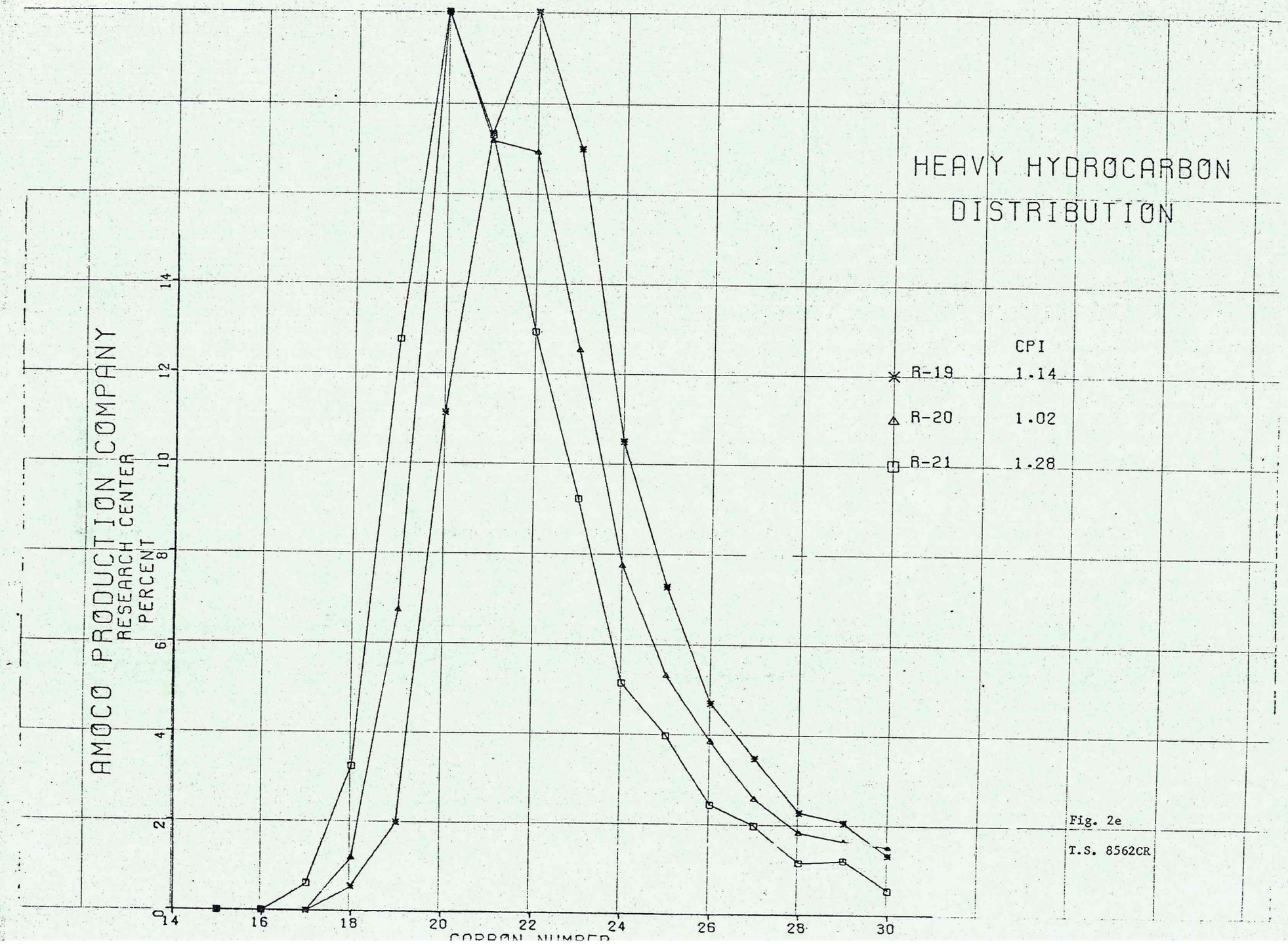

Fig. 2e

T.S. 8562CR

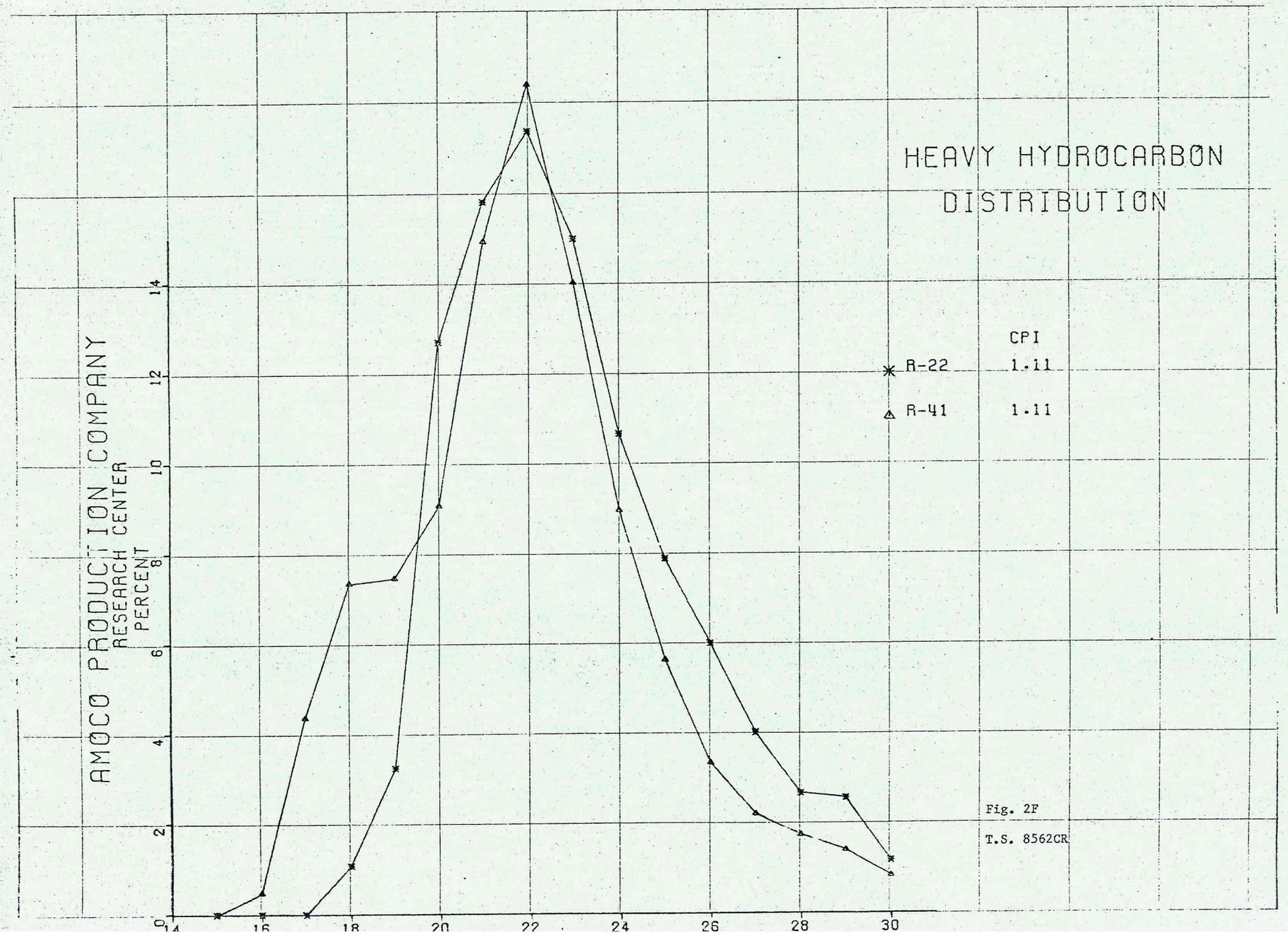

Fig. 2F

T.S. 8562CR

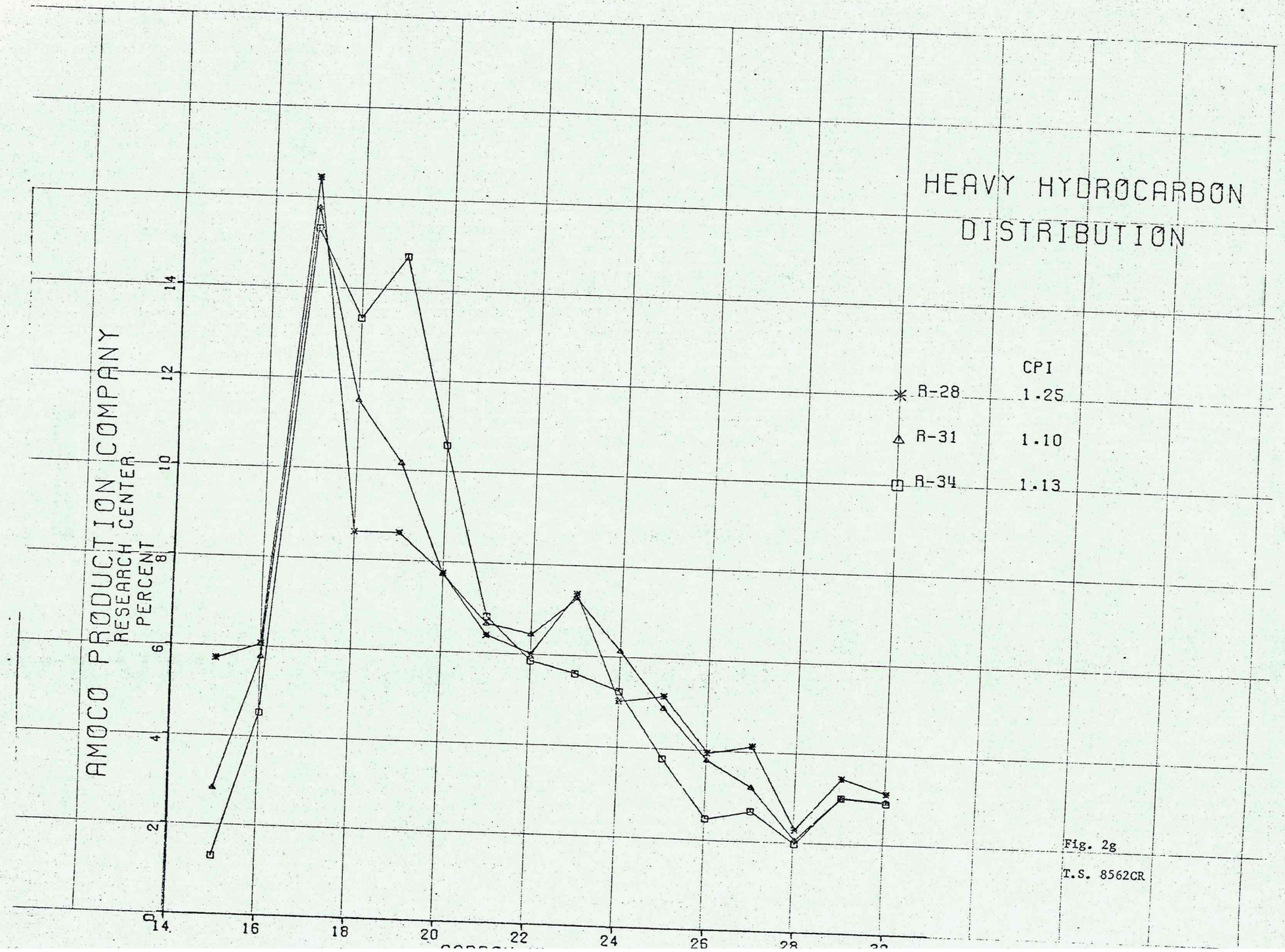

Fig. 2g

T.S. 8562CR

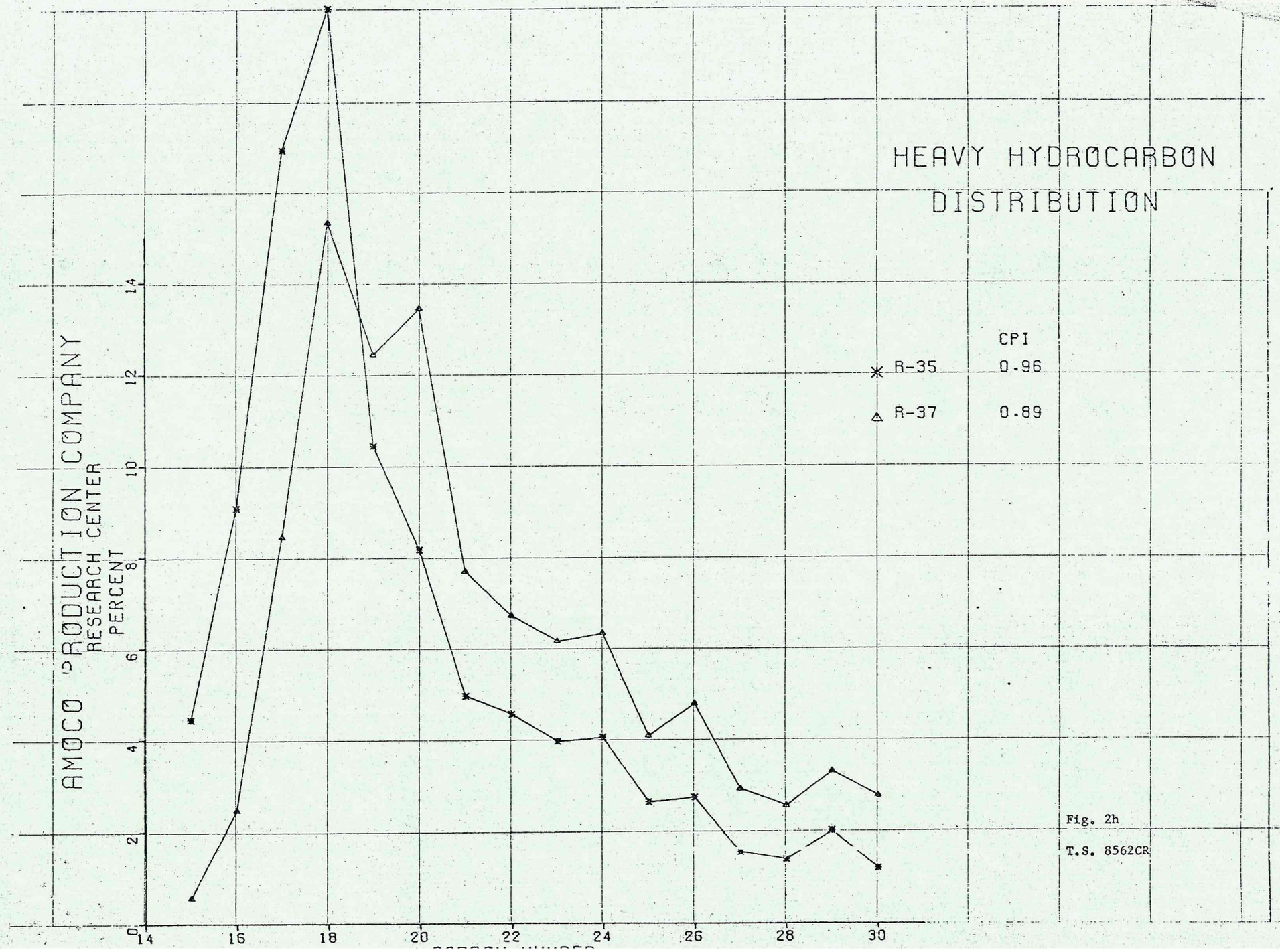

Fig. 2h

T.S. 8562CR

AMOCO PRODUCTION COMPANY
RESEARCH CENTER

Source Rock Evaluation

Outcrop Sample Kandik Basin, Alaska
J-K Shale

Geochemistry Group

R. J. Harwood

Distribution: P. H. Garrison, Attn. Terry Cooper - Denver
E. E. Lafaye - Denver
Chief Geologist - General Office
W. G. Ayrton - Amoco Canada
W. R. Walton
J. A. Momper

Technical Service 8562CR Addendum
Job No. 9413
Requested by Terry Cooper
DENVER DIVISION

Robert R Thompson (Mar 2, 1973)
GAM

Technical Service 8562CR Addendum
Denver Division

INTRODUCTION

An additional quantity of sample R-3 (8203) from the Kandik Basin (Figure 1), was submitted for source rock analysis on February 9, 1973 by L.C. Furer. The purpose of the reanalysis of this sample from Technical Service No. 8562CR was to obtain a valid kerogen diagenesis result; the original sample appeared contaminated on the basis of the original data.

DISCUSSION

Reanalysis of sample R-3 for source rock parameters (Table 1) showed it to be a petroleum NON-SOURCE with very small amounts of extract as was the previous sample. Even though the measured organic carbon in the new sample was 0.0,* it was possible to obtain sufficient organic material for both a visual kerogen determination and an elemental analysis because of the large sample size and an unusually efficient kerogen separation. Both the visual kerogen results (Table 2) and the elemental analysis (Table 3) show this kerogen to be a gas-generating type, to be at PAST PEAK generation for gas, and approaching the ADVANCED stage of diagenesis.

Robert J. Harwood

Robert J. Harwood
RJH:uw

---

*It was estimated that a few hundredths of a percent of organic matter was present.

OFFICE Denver AREA Northwest

AUTHORIZED BY Terry Cooper DATE August 15, 1972

TECHNICAL SERVICE NUMBER 8562CR Addendum

STATE Alaska COUNTY

AMOCO PRODUCTION COMPANY
RESEARCH CENTER
SOURCE ROCK EVALUATION

SAMPLE NUMBER	SAMPLE TYPE	Location	AGE	LITHOLOGY	DEPTH FT.	INSOLUBLE RESIDUE %	TOTAL ORGANIC CARBON WT. %	EXTRACTABLE ORGANIC BBL/ACRE FT.	EXTRACTABLE HYDROCARBON BBL/ACRE FT.	EXTRACT. HYDROCARBON / EXT. ORG.		HYDROCARBON GENERATION CAPABILITY
SURFACE SAMPLE OUTCROP		0.										
R-109 (R-3 rerun) 8203	OTCP	67°35'N,145°08'W	J-K	shale	0.0	85.8	0.00*	0.5	0.1	0.29		NON SOURCE

T.S. 8562CR

Table 1

*Below detection limit

OFFICE Denver AREA Northwest

SUBMITTED BY L. C. Furer DATE

TECHNICAL SERVICE NUMBER 8562CR Addendum

STATE (PROVINCE) Alaska COUNTY

WELL LOCATION Outcrop 67°35'N, 145°08'W

Amoco Production Company

RESEARCH CENTER
ORGANIC DIAGENESIS DATA

SAMPLE			FORMATION	LITHOLOGY	DEPTH	ELEMENTAL ANALYSIS, PERCENT				RATIO H/C	STATE OF DIAGENESIS	HYDROCARBON TYPE BY	
NUMBER	TYPE	QUALITY				CARBON	HYDROGEN	OXYGEN	NITROGEN			% HYDROGEN	PYROLYSIS
R-109 (R-3 rerun)			J-K	Shale	Outcrop	91.3	3.4	6.4	0.0	0.45	Past Peak (gas)	Gas	
8203													

REMARKS:

ANALYST Roger E. LaPlante DATE

TABLE 3

MICROSCOPIC KEROGEN ANALYSIS

Division: Denver
Well Name: Outcrop
Location: 67°35'N, 145°08'W
State or Country: Alaska
Geol. Province: Kandik Basin

SRA No.	Depth (ft)	Formation	AGE	Color	Scale	Kerogen Type and Stage of Diagenesis	Description - R
R-109 (R-3 rerun) 8203	0		J-K	Dark brown to black	6-7	Gas type	70% Plant debris 25% Finely-divid amorphous ma 5% Charcoal-lik fragments. Palynomorphs fair to poor servation an very dark br to black.

COLOR	CARBONIZATION SCALE	WEIGHT % CARBON
LIGHT YELLOW	1	65 %
YELLOW	2	≈70%
LIGHT BROWN	3	≈75 %
MEDIUM BROWN	4	≈ 78 %
DARK BROWN	5	≈81%
BLACK	6	≈84 % ≈86 %
ALL ORGANIC MATTER	7	≈ 90 %

Carl Bennett

T.S. 8562CR
Table 2

TS:

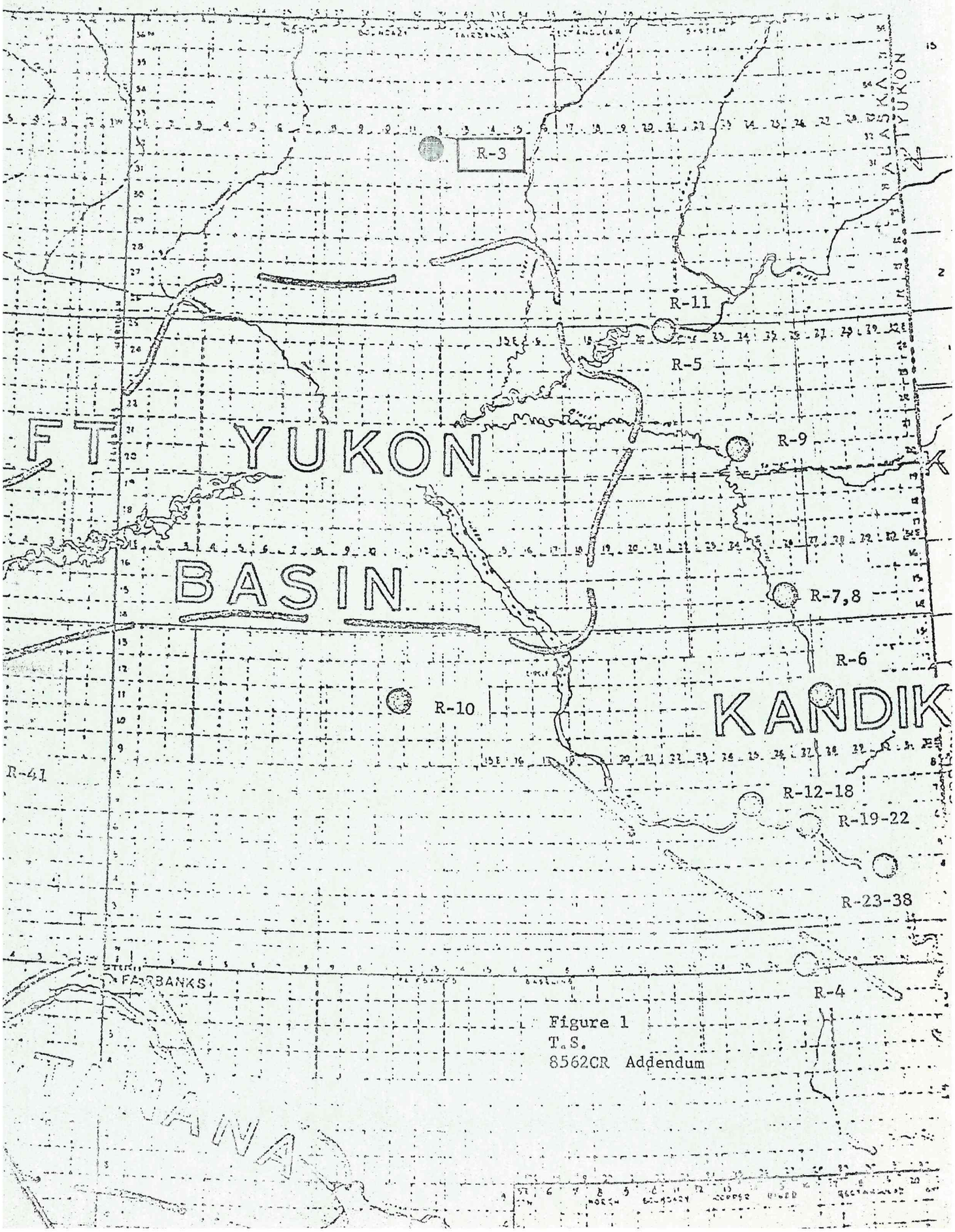

Figure 1
T.S.
8562CR Addendum